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ABSTRACT

An alternating treatments design was used to evaluate and compare the instructional effectiveness of six treatment packages in teaching receptive picture vocabulary to 12 mildly handicapped children (ages 3-6 years). Independent variables in the treatment packages included: least-to-most prompting, correction, group instruction, and individual instruction. The combination of individual instruction with correction and the combination of group instruction with least-to-most prompting proved to be the best techniques in terms of the number of learned vocabulary words. When directly compared, both produced similar results in the number of words learned and retained. However, the group treatment package provided several instructional advantages, such as providing instruction to several students simultaneously, including peers in instruction, incorporating cooperative learning, and providing reinforcement through peers. Includes 116 references. (Author/DB)

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Group and Individual Instructional Procedures: Least-to-most Prompting Versus Correction

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Running Head: LEAST-TO-MOST

Abstract

An alternating treatments design was utilized to evaluate and compare the instructional effectiveness of six treatment packages in teaching receptive picture vocabulary. Independent variables in the treatment packages included: least-to-most prompting, correction, group instruction, and individual instruction. The combination of individual instruction with correction and the combination of group instruction with least-to-most prompting proved to be the best techniques in the number of learned vocabulary words when compared with other treatment packages. When directly compared, both produced similar results in the number of words learned and retained. However, the group treatment package provided several instructional advantages, such as providing instruction to several students simultaneously, including peers in instruction, incorporating cooperative learning, and providing reinforcement through peers.

Group and Individual Instructional Procedures:
Least-to-most Prompting Versus Correction

Instruction is the "process in which a teacher systematically and effectively arranges and rearranges an environment to bring about desired behavioral changes" in children (Bijou, Birnbrauer, Kidder, & Tague, 1966). Arranging the environment may consist of teaching students in a variety of settings, including individual, small group, and/or large group instruction. While individual instruction or one-to-one tutoring consists of teaching one student at a time in a structured setting, group instruction is the instruction of teaching more than one child at any single moment.

By lowering the teacher/pupil ratio, as in a one-to-one teaching setting, it is believed that student progress is considerably accelerated (Fischer, & Glanville, 1970). In fact, research has shown that students instructed in a one-to-one tutorial situation performed academically superior to students instructed in a group setting (Jenkins, Mayhall, Peschka, & Jenkins, 1974). Bloom (1984) suggests that students individually tutored perform approximately two standard deviations above the mean performance of their group instructed peers. Built into the system of one-to-one instruction is the fact that children are provided with the opportunity to produce more correct responses (Childs, & Snow, 1986), more on-task time, and more teacher attention (Westling, Ferrel, & Swenson, 1982). For instance, students with severe handicaps learn dressing skills more efficiently when they are taught in a one-to-one instructional setting (Alberto, Jobes, Sizemore, & Doran, 1980), and made more task-relevant responses and

fewer counter-productive responses during instruction (Ranieri, Ford, Vincent, & Brown, 1984).

Traditionally, the one-to-one instructional approach has been considered as a superior approach in the education of students with handicaps (Lovatt, 1962; Polloway, Cronin, & Patton, 1986). Many researchers feel that a one-to-one teacher/student ratio is deemed necessary for children who have handicaps, while group instruction was seen only as an eventual goal (Frankel, & Graham, 1976). Logistical problems have been encountered when the behavior of several children who have a variety of handicaps is targeted for change in a group setting (Liberman, 1968; Strain, 1975).

While many feel that a one-to-one teacher/student ratio provides optimal instructional results, others feel that it is neither necessary nor preferable (Brown, Hermanson, Klemme, Haubrich, & Ora, 1970). One-to-one instruction is seen by some as restrictive (Fink, & Sandall, 1980; Glazzard, 1981) and a technique which fosters overdependency (Glazzard, 1981). In order for students to "perform successfully in the classroom, they need to acquire a set of skills that is quite independent of successful functioning in a one-to-one environment" (Koegel, Egel, & Dunlap, 1980). Skills may include attending, responding, and learning when numerous other students are involved in an activity (Koegel, Egel, & Dunlap, 1980). Others have questioned the efficacy of isolating students in an individual instructional setting (Fink, & Sandall, 1980).

Recent studies have indicated group instruction can be considered as an alternative instructional approach when students

are provided with as many opportunities to respond as in an individual approach (Oliver, 1983). For children with handicaps, group instruction usually refers "to a structured, data-based training activity that occurs in a setting where two to four" students are taught consecutively (Brown, Holvoet, Guess, & Mulligan, 1980). It is felt that group instruction may aid in (1) helping children who typically have problems with generalizing a trained skill to new situations, (2) providing superior outcomes, and (3) providing enjoyment to the student (Brown, Hermanson, Klemme, Haubrich, & Ora, 1970).

In order to promote the generalization of skills, instruction must incorporate training into naturally occurring physical stimuli (Stokes, & Baer, 1977). For instance, it has been shown that skills taught in a one-to-one setting may not carry over into larger group settings (Koegel, & Rincover, 1974), while tasks presented in a group setting provide the opportunity for the generalization of the skill taught in a naturalistic environment (Brown, Holvoet, Guess, & Mulligan, 1980). Accordingly, students may generalize skills taught in a group setting better than those taught in an individual setting (Oliver, & Scott, 1981).

Researchers have found that when children are assigned similar tasks, those provided with group experiences perform qualitatively and quantitatively superior to their peers who work in an individual setting (Fletcher, 1985; Hill, 1982; Johnson, Johnson, & Scott, 1978; Johnson, Johnson, & Tauer, 1979; Johnson, Skon & Johnson, 1980). However, students with special needs may not perform as well in the type of group experience usually provided to other children

(Kohl, Wilcox, & Karlan, 1978; Smith, & Meyers, 1979). For instance, children who are disadvantaged increased their learning rate when instruction was individually paced (Kahle, Douglas, & Nordland, 1976; Kahle, Nordland, & Douglas, 1976).

Group instruction has been shown to be a viable technique with children and adults who exhibit a variety of handicapping conditions. In addition, research has indicated that some skills may be taught more effectively in group settings. Group instruction has been shown to be effective in teaching communication skills (Bieberdorf, & Pear, 1977; Borus, Greenfield, Spiegel, & Daniels, 1973; Kohl, Wilcox, & Karlan, 1978; Oliver, 1983; Storm, & Willis, 1978) academic and pre-academic skills (Brown, Hermanson, Kleme, Haubrich, & Ora, 1970; Brown, & Perlmutter, 1971; Fink, & Sandal, 1978; Favell, Favell, & McGimsey, 1978), socialization skills (Newcomer, & Morrison, 1974; Wheeler, & Wislocki, 1977), and self-help skills (Elium, & McCarver 1980; Matson, DiLorenzo, & Dawson, 1981; Tobias, & Cortazzo, 1963). Group reinforcement techniques have also proven to be effective in strengthening desired skills (Herman, & Tramontana, 1971; Liberman, 1968; Thorpe, Chiang, & Darch, 1981), as well as increasing the acceptance, by caretakers, of individuals who were institutionalized (Davis, 1969). Interestingly, many studies primarily focus on the use of group instruction with children who exhibit severe handicaps rather than those who have mild handicaps (Polloway, Cronin, & Patton, 1986).

Group instruction has an added advantage of being an efficient use of teacher time which is useful in situations where staff is limited (Liberman, 1968; Oliver, & Scott, 1981). Group training

appears to be a viable alternative where limited resources precluded the use of one-to-one instruction (Liberman, 1968; Oliver, 1983; Oliver, & Scott, 1981). Some researchers argue that the realities of student/teacher ratios in the classroom dictate the use of group training if student instructional time is to be maximized (Brown, Holvoet, Guess, & Mulligan, 1980; Fink, & Sandall, 1980; Jenkins, & Mayhill, 1973; Oliver, & Scott, 1981; Storm, & Willis, 1978). Elium and McCarver (1980) found that in training self-help skills to children with profound mental handicaps, individual student progress was approximately the same whether the child was trained in an individual or group setting; however, the group setting was more efficient in (1) steps learned per hour, and (2) staff time. Favell, Favell, and McGimsey (1978) demonstrated that group instruction was three times more efficient in terms of teacher time than one-to-one tutoring.

Researchers have anecdotally noted that group instruction provides more learning opportunities than those in which simple cues, prompts, and reinforcers are provided (Alberto, Jobes, Sizemore, & Doran, 1980; Favell, Favell, & McGimsey, 1978). For instance, behavior modeling can be provided by group peers (Bandura, 1971). This 'shared' modeling effect in group training settings has been observed in several studies (Bieberdorf, & Pear, 1977; Brown, Klemme, Hermanson, Haubrich, & Ora, 1970; Favell, Favell, & McGimsey, 1978; Kohl, Wilcox, & Karlan, 1978; Orelove, 1982; Storm, & Willis, 1978). The observational opportunities in group settings afford better generalization of concepts in children with handicapping conditions (Oliver, & Scott, 1981). For instance,

Yoder and Forehand (1974) found children who exhibit a mental handicap use behavior modeling in the same manner as children who exhibit no handicapping condition.

In addition to the unplanned utilization of behavior modeling, 'behavior modeling training' (Bandura, 1971; Decker, & Nathan, 1985), has been effectively employed in teaching desired tasks to children and adults with handicaps. When paired with other instructional techniques (e.g., verbal cues), modeling has been shown to be an effective teaching strategy (Forehand, & Yoder, 1973; Rosenthal, & Kellogg, 1973; Smith, & Meyers, 1979; Snyder, Apolloni, & Cooke, 1977; Talkington, Hall, & Altman, 1973; Yoder, & Forehand, 1974). Mansdorf (1977a, 1977b) believed modeling facilitated the acquisition of language concepts in children.

Several logistical problems are associated with group instruction (Oliver, 1983; Strain, 1975). The most notable among these is the multivariate needs demonstrated by a heterogeneous group of children. Those needs have been shown to be less effectively met in group instruction than one-to-one training (Oliver, 1983). The research which demonstrated the effectiveness and efficiency of the group method over individual instruction primarily concentrated on training children who exhibit a homogeneous functioning level (Oliver, 1983). Several researchers have stated that children, even those with severe handicaps, can be effectively taught in a group setting; however, few studies have investigated group instruction of children who are functioning at different levels. Rincover and Koegel (1977) reported that four children diagnosed as having autism and who functioned at different

levels were effectively taught in a group setting. Graziano (1970) found "objective, behavioral concepts and techniques can be effectively developed and applied to groups" of children who were individually diagnosed as being affected with a severe psychosis. In order to be a viable option, group instruction must provide empirically demonstratable individualized instruction for each participant (Oliver, 1983). Some have suggested a combination of individual and small group instruction as an alternative teaching technique which may meet the the needs of students with varying abilities (Broome, & Wambold, 1977).

It appears that workable and potent methods of group instruction need to be identified for children who exhibit handicapping conditions (Reid, & Favell, 1984) before it can be considered as an option. It has been suggested that research be conducted (1) to determine the effectiveness of various instructional techniques (system of least prompt) in individual and group settings (Alberto, Jobes, Sizemore, & Doran, 1980; Oliver, & Scott, 1981), (2) to systematically evaluate the applicability of behavioral techniques shown to be effective in one-to-one training situations in group settings (Koegel, & Rincover, 1974), and (3) to investigate whether group teaching methods shown to be effective in research are applicable in applied settings (e.g., schools) (Favell, Favell, & McGimsey, 1978).

In order for instructions to be systematic, it needs to reflect those practices which are currently viewed as acceptable (Snell, & Zirpoli, 1987). Etzel and LeBlanc (1979) suggest systematic instruction should consist of the least complex strategy selected

from two or more alternative methods which are equally supported by data. In addition, the strategy selected should be the least restrictive or intrusive method (Favell, et al., 1982; Morris, 1985). This means that the method chosen for systematic intervention should be the simplest, most effective technique for changing a behavior (Gast, & Wolery, 1987).

One method of instruction that is considered both effective and simple to apply is prompting. Prompting utilizes stimulus conditions to increase the probability of obtaining a correct response from a student (Koegel, Egel, & Dunlap, 1980; Mosk, & Bucher, 1984; Walls, Ellis, Zane, & Vanderpoel, 1979). It may be applied before a child is asked to respond, or given after the child has provided an incorrect response in order to facilitate the child's opportunity to respond correctly (Walls, Dowler, Haught, & Zawlocki, 1984). Prompts are presented to the student in order that a behavior, which does not occur naturally or frequently, develops. By applying assistant antecedents (i.e., prompts) to the stimulus (i.e., verbal cue), the chance of the desired behavior occuring increases. Accordingly, the behavior exhibited by the child can be shaped (i.e., developed) (Snell, & Smith, 1978). Prompts are only useful if they are successful in guaranteeing the production of the desired response and if they can be eventually removed or faded (Koegel, Egel, & Dunlap, 1980).

Adams (1982) noted that the greater part of research has focused on the use of prompts in isolation (e.g., using a visual cue to increase the probability of the student responding correctly), rather than on the use of prompt sequences. Prompt sequences begin

with one prompt and change to another prompt. Steps in prompt sequences are small enough to provide a smooth transition between the steps in the sequences (Schloss, 1986). There are two instructional procedures which utilize prompt sequences (Adams, 1982). One technique, graduated guidance (Foxx and Azrin, 1973), consists of employing prompts which begin with the most intrusive or restrictive prompt (e.g., physical guidance) and proceeding to a lesser prompt (e.g., gesturing) (Adams, 1982).

Least-to-most prompting, an alternative to more instrusive methods of instruction (Wolery, & Gast, 1984), involves the teacher beginning to provide

> instruction at the verbal level. If the learner fails to produce the correct response at this level, the teacher proceeds to the next level of prompting by using gestures or demonstration. Should the learner still fail to emit the correct response, the teacher would then use partial physical guidance. If the correct response is not given by the learner at this level, the teacher moves to the lowest level of sequencing prompts and provides full physical guidance. (Csapo, 1981, p. 39)

Wolery and Gast (1984) indicated that this system of least prompts would best be utilized with children who could imitate and should be used with discrete responses such as labeling objects.

Unlike graduated guidance, which consists of providing the student with the least amount of feedback and progresses to the most feedback (Grimes, 1981), the least-to-most prompt sequence begins by providing the student with the most feedback. Feedback involves

providing prompts which "enhance self-correction or self-confirmation of performance" (Schworm, & Abelseth, 1978). Lawrence and Winschel (1975) state that teachers must promote in children an independent knowledge of success and failure. Least-to-most prompt sequences involve providing the student with this internal knowledge of performance (Alberto, & Schofield, 1979) as it provides for error correction (Haught, Walls, & Crist, 1984).

The sequence of prompts utilized is usually based on the teacher's preference (Walls, Zane, & Thvedt, 1980); however, the teacher must present prompts on a smooth continuous basis in order for that sequence to be effective (Alberto, & Schofield, 1979; Spears, Rusch, York, & Lily, 1981; Striefel, & Cadez, 1983). In fact, the presentation rate of the prompts can be a vital factor in the students' responsiveness to instruction (Etzel, & LeBlanc, 1979). When the least-to-most prompting technique is utilized, Snell and Zirpoli (1987) suggest that a latency interval between the presentation of the natural cue and the progressively more intrusive prompts consist of three to five seconds. Therefore, the teacher's behavior can also be manipulated to obtain significant results in student acquisition of a behavior (Close, Irvin, Prehm, & Taylor, 1978).

This system of least-to-most prompting has been effective in teaching children and adults with handicaps various skills: pre-academic behavior (Correa, Poulson, & Salzberg, 1984), academic skills (Bellamy, & Buttars, 1975; Brown, Jones, Troccolo, Heiser, Bellamy, & Sontag, 1972; Gold, & Barclay, 1973; Schloss, Harriman, & Pfeifier, 1985), self-help skills (Horner, & Keilitz, 1975; Johnson,

& Cuvo, 1981; O'Brien, & Azrin, 1972; O'Brien, Bugle, & Azrin, 1972; Tucker, & Berry, 1980), vocational skills (Bellamy, Peterson, & Close, 1975; Brown, Bellamy, Perlmutter, Sackowitz, & Sontag, 1972; Cronin, & Cuvo, 1979; Cuvo, Leaf, Borakove, 1978; Spears, Rusch, York, & Lilly, 1981), and leisure time activity (Giangreco, 1983). However, little research has been conducted to evaluate the validity of this technique to other prompting systems or other simple correction procedures. Walls, Ellis, Zane, and Vanderpoel (1979) evaluated the effectiveness of several types of prompts in isolation (e.g., visual, auditory, tactile) and a combination of those prompting systems in teaching adults a complicated assembly task. They found no difference in retention levels. Walls, Crist, Sienicki, and Grant (1981) found no difference when comparing the performance of adults when least-to-most, most-to-least, and within-mode prompts were utilized to teach vocational tasks. On the other hand, least-to-most prompting sequences were shown to be more effective than most-to-least prompting sequences in teaching children correct utensil use (Nelson, Cone, & Hanson, 1975) and in increasing student fluency on a pre-academic task (Csapo, 1981).

Research has demonstrated the effectiveness of the least-to-most prompting sequence in teaching isolated skills. Unfortunately, the research is mixed regarding its inferiority or superiority over various other prompting techniques or simple correction procedures. Glendenning, Adams, and Sternberg (1983) suggest that further research needs to be conducted to evaluate the effectiveness of prompting procedures in children of different ages, levels of handicaps, and different environments. Wolery and Gast

(1984) state that the effectiveness and efficiency of the least-to-most prompting sequence needs to be compared to other procedures.

In conclusion, it appears that group instruction may be a viable option to individual instruction. As an alternative, it has been suggested that group instruction may be utilized in place of one-to-one instruction where classroom resources are limited. Research identifying the effectivess of specific instructional techniques, such as prompting sequences within group and individual settings, needs to be evaluated as well as the application of those techniques in applied settings. The system of least-to-most prompting sequence provides the student with the opportunity to independently perform a task before he is corrected. Research comparing this procedure in group and individual settings as well as comparing it to other instructional techniques has been limited.

The present study focused on the attainment of receptive vocabulary and experimentally compared preschool children, who were identified as handicapped, on several independent variables: group instruction, individual instruction, system of least-to-most prompts, and simple correction procedure. Dependent variables included the percentage of receptive vocabulary words learned during a specified period of time.

METHODS

Subjects

The population for this study was drawn from children who attended a public supported cross-categorical preschool program for children identified as demonstrating handicaps. The subjects

consisted of twelve preschool children, aged three to six years, identified as exhibiting a mild handicapping condition. A mild handicap was defined as a delay of two to three standard deviations in at least one area of development (e.g., motor, social/emotional, cognitive, communication) as measured, minimally, by two standardized measures.

The subjects for this study were randomly assigned to one of three groups (i.e., four pupils in each group). The children who composed each group demonstrated similar handicapping conditions (e.g., one group consisted of three children who were identified as exhibiting a mild mental handicap and one child with a physical handicap who also demonstrated a communication delay, while the children in the other two groups demonstrated similar handicaps) and age. Once the children were placed in a group, each group was randomly assigned one of the instructional techniques studied (i.e., group programming, individual programming, individual/group programming).

Materials

Photographs of various unfamiliar objects (e.g., carrot, dog, cow) were selected and recorded as target receptive vocabulary words for training. Photographs were utilized as they accurately portrayed a concept (e.g., cow) while providing for easy manipulation in a classroom situation. To insure that the photographs were similar in dimension (e.g., size, color, form, or in any combination of these three), they were drawn from commercially prepared photograph libraries (e.g., Developmental Learning Materials Photograph Library). When they were presented,

the photographs belonged to a single vocabulary group (e.g., transportation, fruit).

Two vocabulary banks were established for each treatment group prior to intervention. A vocabulary bank refered to a series of twenty receptive vocabulary words (e.g., dog) selected for each type of treatment (i.e., treatment group A: twenty words for group instruction/least-to-most prompting, twenty words for group instruction/correction procedure) from the words identifed as unfamiliar to the students during the testing procedure. Four new words were used each time a treatment condition was alternated. Each new series of words was drawn from the vocabulary bank created for a particular treatment condition (e.g., group instruction/correction procedure).

Experimental Procedure

This study involved the comparison of two instructional procedures, least-to-most prompting and correction procedure, within three instructional groups. The instructional groups included: (A) one which received a group treatment procedure combined with a least-to-most prompting or correction procedure, (B) one which received an individual instruction procedure combined with a least-to-most or correction procedure, and (C) one group which received both individual and group instruction utilizing a least-to-most or correction procedure.

Experimental Design. In order to compare the effectiveness of two interventions (e.g., group treatment, individual treatment), an alternating treatments design (ATD) was utilized. According to Barlow and Hayes (1979) the "basic feature of this design . . . is

the fast alternation of two different treatments or conditions, each associated with a distinct and discriminative stimulus." Accordingly, if a behavior is taught using different instructional treatments, that behavior will exhibit different characteristics in the presence of these treatments (Leitenberg, 1973). Both visual analysis (Tawney, & Gast, 1984) and a randomization test (Kazdin, 1984) were utilized to analyze the obtained data.

In order to meet the practical demands of the classroom, Kazdin (1984) suggests that alternation of instructional conditions may be on a daily or fixed block of time (e.g., weekly). For the purpose of this study, conditions were alternated every four sessions (i.e., every four days). Each treatment group received a baseline of four sessions before treatment was initiated. In order to facilitate the documentation of change from baseline to intervention level, a mean percentage of the number of photographs correctly identified for all of the pupils was calculated and plotted for each session during baseline.

Treatment began after the baseline sessions. Each treatment condition was randomly alternated every fifth session (i.e., weekly). The performance level (i.e., percentage of correct responses) of each student was plotted for each session. Each respective treatment was implemented in the appropriate group four times for a total of eight treatments per group. In addition, the mean performance of the students was calculated and plotted.

Testing Procedure. Each participant in this study was assessed prior to treatment using a criterion referenced measure. These data were used to establish an estimate of each child's receptive vocabulary

development. Each child was assessed individually using all of the items from a single concept grouping (e.g., body parts). Initial testing involved presenting an individual child with four photographs (i.e., the named object and three distracting pictures) and asking him or her to point to the correct photograph in response to the cue "Point to name of the object." A correct response consisted of the pupil touching the picture with his or her hand or extending his or her index finger toward the named object within five seconds of the instructor's cue.

Group Instruction. The group instruction intervention program was implemented by a master's level classroom teacher with five years experience in teaching preschool children with various handicapping conditions. The program consisted of the pupils sitting on the floor facing the teacher in one part of the classroom. The pupils were required to sit with their legs crossed and their hands in their laps until they were asked to respond. At the beginning of the instructional session, the teacher asked the pupils to "pay attention and look at me." The pupils faced the teacher who presented one pupil with four photographs of unfamiliar objects which were identified during the testing procedure. The photographs were laid out on the floor approximately one foot in front of the seated pupils. One of the four photographs was a target receptive vocabulary word identified during pretesting. The teacher asked the pupil to repond to one of three requests: "point to name of the object," "where's name of the object?" or "find name of the object." These requests were randomly presented.

Each pupil received twenty successive trials per instructional

session (three trials per stimulus picture). Each pupil received one trial before an additional trial was presented to any of the students. The location of the target photograph was randomized for each trial. In addition, all of the targeted vocabulary words were randomly presented (i.e., the named objects were systematically changed on successive trials [Ashdown, 1984]) during each session. Each pupil was asked to point to the named photograph as evidenced by the pupil touching the picture with his/her hand or extending his/her index finger towards the named object within five seconds of the instructor's cue. The procedure produced daily tallies of the number of correct words identified.

If the pupil responded correctly to the command, the teacher asked the other students in the group if he or she identified the correct photograph by saying "Did he or she get it right?" The teacher enthusiastically said "yes, name of the student pointed to name of the object!" while clapping and encouraging the other pupils to clap.

If the pupil responded incorrectly or not at all within five seconds, two different correction procedures were utilized. The first correction procedures, least-to-most prompting, involved the teacher asking the child sitting to the pupil's right "name of the child, you help him or her point to the name of the object" or the appropriate cue (e.g., "where's name of the object"). If the child modeled the correct response, the teacher repeated the cue. If the pupil responded correctly to the model and cue, he or she was rewarded in the manner described above. However, if the child modeled incorrectly or the pupil responded incorrectly, the teacher

restated the cue and tapped the upper left hand corner of the photograph four times. If the pupil responded incorrectly, the teacher repeated the cue, briefly tapped the photograph as before, and touched the pupil's hand. If the pupil responded inappropriately (i.e., responded incorrectly or neglected to respond within five seconds), the instructor repeated the cue, briefly tapped the correct picture, and physically assisted the pupil to point to the correct photograph. If the pupil responded correctly after any of the cues, he or she was then rewarded in the manner listed above.

The second instructional procedure involved simple correction. The teacher said "no, the restated cue" and physically assisted the pupil to point to the correct picture. After the pupil responded correctly, the teacher asked the other students in the group if he or she identified the correct photograph by saying "Did he or she get it right?" The teacher enthusiastically said "yes, name of the student pointed to name of the object!" while clapping and encouraging the other pupils to clap.

Each pupil was provided with the same number of trials per session regardless of the instructional procedure. A session consisted of each pupil receiving twenty nonconsecutive trials (i.e, the pupils alternate turns). Each pupil was provided with one session per day for each instructional procedure. Each combination of instructional procedures (i.e., group treatment with correction) was utilized for a period of one week. Four photographs were targeted per one week instructional period. For the purposes of this study, any response other than correctly pointing to the named

picture after given the initial cue was counted as an incorrect response.

Individual Instruction. Generally, similar procedures were utilized for the pupils assigned to the individual programming group as those assigned to the group programming group. However, the reinforcement and correction procedures were slightly different. If the pupil responded correctly to the command, he or she received positive reinforcement consisting of the teacher enthusiastically verbalizing exactly what the pupil did (e.g., "Good for you, you pointed to truck!") while patting the pupil on the back.

During least-to-most prompting, the teacher restated the cue and tapped the upper left hand corner of the target photograph four times. If the pupil responded incorrectly, the teacher repeated the cue, briefly tapped the photograph as before, and touched the pupil's hand. If the pupil responded inappropriately, the teacher repeated the cue, briefly tapped the correct picture, and physically assisted the pupil to point to the correct photograph. Once the pupil responded appropriately after a prompt presentation, the teacher then reinforced the pupil in the same manner mentioned above.

Simple correction involved the teacher saying "no, the restated cue" and physically assisting the pupil to point to the correct picture. After the pupil responded correctly, the teacher enthusiastically verbalized what the pupil did (e.g., "Good for you, you pointed to truck!") while patting the pupil on the back.

Individual/Group Programming. In the final experimental procedure, the group was treated after both experimental procedures described

above were completed. The treatments which proved to be more effective in the group and individual procedures (i.e., least-to-most prompting and correction, respectively) were compared. The treatments utilized in both procedures remained constant.

RESULTS

Group Instruction

In order to compare the group instruction treatments (i.e., group instruction using a correction procedure, group instruction using least-to-most prompting), four subjects were selected. Table 1 provides a brief description of each student. Prepositions (e.g., down, below) were selected as a category for both treatments.

The randomized treatments were presented in the following order: baseline, least-to-most prompting, least-to-most prompting, correction, correction, correction, least-to-most prompting, correction, least-to-most prompting. Figure 1 displays the baseline and training data according to the mean percentage of photographs correctly identified in each session. When comparing adjacent and nonadjacent conditions of either treatment, data paths were both variable and stable. Level changes between adjacent conditions were mixed. When compared to baseline levels, each condition exhibited an accelerating and improving trend. Overlap in trend (the percentage of data points which coincide between two adjacent conditions) was relatively high. There was a large percentage of overlap between adjacent conditions. In addition, the change in level between the adjacent conditions was limited. Visual analysis of the data indicated there was little difference between

Table 1.
Demographic Characteristics of Subjects

Subject	Sex	Age at Beginning of Study	Diagnosis	Selected Educational Goals
Joshua	M	5 years 4 months	moderate physical handicap	improve balance skills improve hamstring muscle flexability improve readiness skills
Jonas	M	5 years 11 months	learning disability moderate hearing loss	follow oral directions improve generalization of taught skills to different environments develop effective use of cognitive learning strategies
Sheldon	M	5 years 10 months	moderate communication handicap	improve expressive language skills develop use of specific articulation skills
Andrew	M	4 years 9 months	mild mental handicap moderate communication delay	improve understanding of number concepts improve the development of specific readiness skills improve understanding of oral language improve understanding of basic concepts increase use of spontaneous oral language

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group treatment utilizing a correction procedure (C) and group treatment utilizing least-to-most prompting (LP).

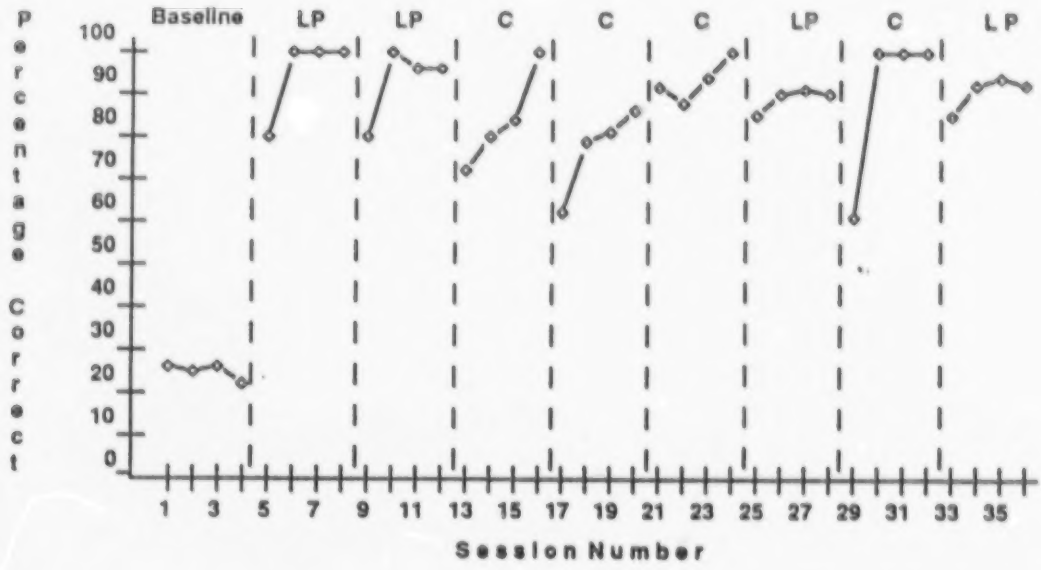

Figure 1. Mean percentage of pictures identified correctly during baseline, least-to-most, and correction sessions in group treatment.

The means of each condition (i.e., least-to-most prompting: 94.96%, 93.12%, 89.06%, 90.87%; correction procedure: 84.03%, 77.18%, 93.21%, 90.31%) were statistically compared through the use of the randomization test. This technique, a statistical test designed for ATD, is utilized to determine whether or not the

differences between conditions may be attributed to chance assignment. An obtained significance level of .057 approached a significant difference between the two treatments. Group treatment which incorporated the use of a least-to-most prompting system was slightly more effective in increasing the number of pictures the subjects were able to identify when compared to a group treatment package utilizing a correction procedure.

Individual Instruction

Two boys and two girls served as subjects for comparing the individual treatment packages (i.e., individual instruction using a correction procedure, individual instruction using a least-to-most prompting procedure). Table 2 provides a brief description of the target students. Categories of words selected to use during this portion of the study included household items (e.g., beater, sponge) and environmental words (e.g., garden, beach). The words were utilized to determine whether there was a difference between two individual treatments.

The randomized treatments were presented in the following order: baseline, least-to-most prompting, least-to-most prompting, least-to-most prompting, correction, correction, least-to-most prompting, correction, correction. Results are illustrated in graphic form for mean group performance in Figure 2. When comparing adjacent and nonadjacent conditions of either treatment, data paths showed variability. Level changes between adjacent conditions were generally mixed. All conditions showed an accelerating and improving trend when compared to baseline levels. There was an

Table 2.
Demographic Characteristics of Subjects

Subject	Sex	Age at Beginning of Study	Diagnosis	Selected Educational Goals
Lance	M	3 years 6 months	moderate communication handicap	improve understanding of spoken language improve sentence structure improve behavior control skills
Sarah	F	4 years 1 month	mild mental handicap severe expressive communication disability	establish a functional signing vocabulary correctly articulate specific sounds improve pre-readiness skills increase gross and fine motor skills
Tamara	F	3 years 10 months	mild mental handicap visual delay	improve pre-readiness skills increase receptive and expressive language skills
Andrew	M	5 years 2 months	mild mental handicap mild behavior disorder moderate communication delay	improve participation in group activities increase independence in the completion of assigned tasks develop readiness skills improve expressive language skills improve articulation skills

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overlap in the percentage of pictures identified correctly between adjacent conditions. Because of the mixed changes in level between the two conditions and the large level of overlap in adjacent conditions, visual analysis of the data revealed the correction procedure (C) was equally as effective as least-to-most prompting (LP).

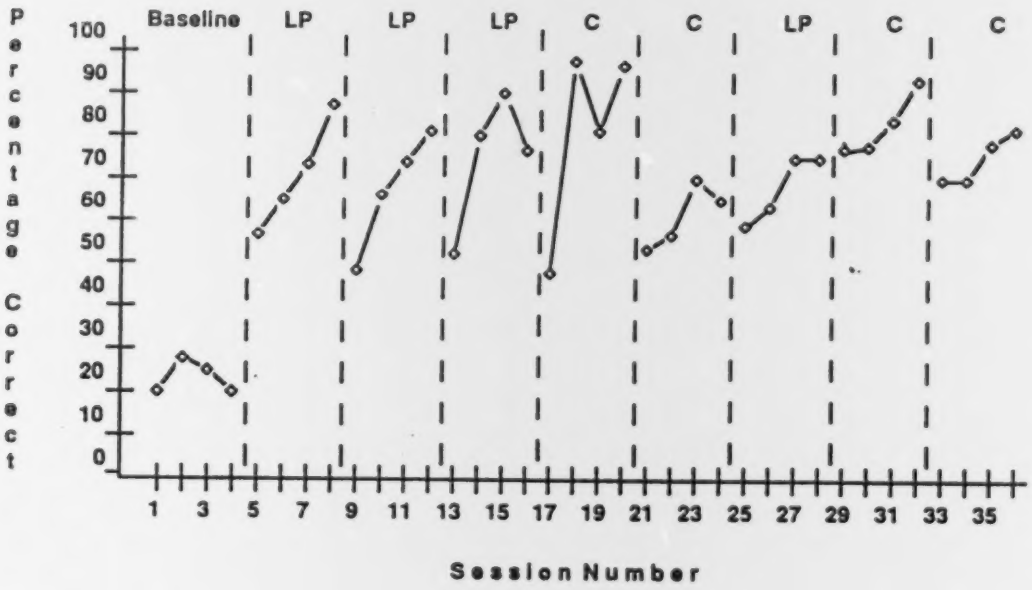

Figure 2. Mean percentage of pictures identified correctly during baseline, least-to-most, and correction sessions in individual treatment.

In order to statistically analyze the differences between the effects of the treatments, the randomization test was employed.

Composite group means were utilized to assess whether the differences between individual treatments were due to chance. The means for least-to-most prompting included: 70.56%, 67.39%, 74.79%, 68.02% and the correction procedure included: 80.73%, 61.32%, 83.02%, 74.99%. The obtained significance level equaled .057. The individual treatment package which incorporated the use of a correction procedure approached statistical superiority over one which included a least-to-most prompting system.

Comparison of Individual Instruction and Group Instruction

Three boys and one girl served as subjects for comparing the individual with group treatment packages. Table 3 provides a brief description of the students. The categories selected to compare the two treatment packages included occupations (e.g., letter carrier, pilot) and animals (e.g., eagle, colt).

In order to determine which technique was more effective in teaching receptive vocabulary the better treatment in both group and individual was selected. It was determined through the use of the randomization test the individual treatment package which incorporated the correction procedure was slightly more effective than one which utilized least-to-most prompting. On the other hand, the least-to-most prompting system was slightly more effective in group instruction. Therefore, the two instructional systems were directly compared.

The randomized treatments were presented in the following order: baseline, correction, least-to-most prompting, least-to-most prompting, correction, least-to-most prompting, correction, least-to-most prompting, correction. Graphic representation of the

Table 3
Demographic Characteristics of Subjects

Subject	Sex	Age at Beginning of Study	Diagnosis	Selected Educational Goals
Justin	M	3 years 2 months	mild mental handicap mild communication handicap	improve pre-readiness skills improve expressive and receptive language skills improve gross and fine motor skills
Sherry	F	5 years 2 months	mild mental handicap moderate behavior disorder	increase participation in group activities participate in group activities in ways which are not disruptive to group functioning improve readiness skills
Brian	M	3 years 6 months	mild mental handicap	improve pre-readiness skills develop expressive and receptive language skills
Michael	M	4 years 8 months	mild mental handicap moderate communication delay mild physical handicap	improve pre-readiness skill development improve range of motion in the lower extremities improve understanding of oral language improve self-help skills increase use of spontaneous oral language

results are presented in Figure 3. The trend stability of all the conditions were variable. Accordingly, the change in trend stability between adjacent conditions was variable to variable. The level changes between adjacent conditions were mixed. When compared to baseline levels, all conditions showed accelerating and improving trend. Because of the varied findings when visually comparing adjacent condition, there appeared to be no significant difference in the effect of either treatment package.

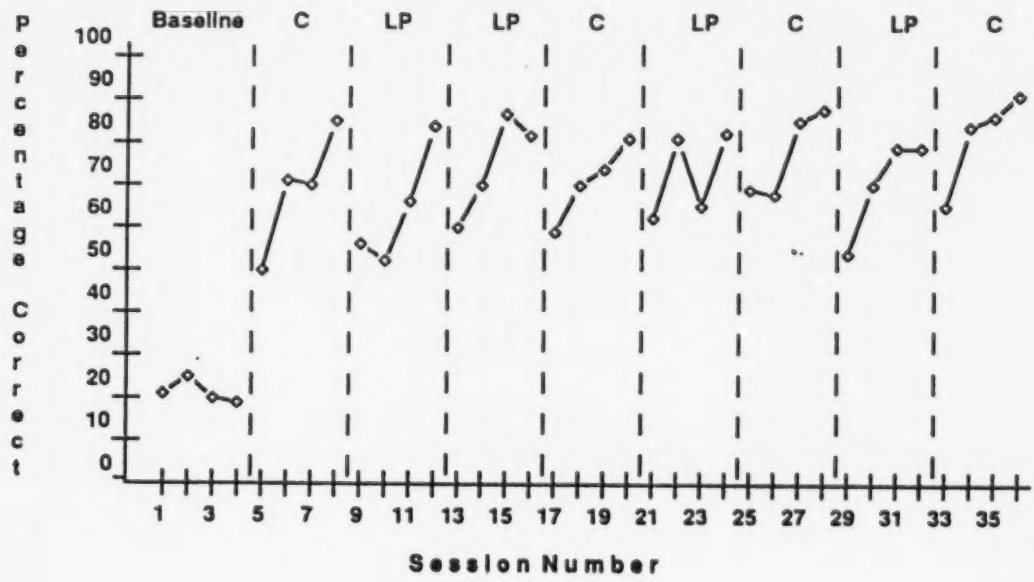

Figure 3. Mean percentage of pictures identified correctly during baseline, least-to-most, and correction sessions in group treatment and individual treatment.

When the randomization test was employed to determine if any differences between the effect of either treatment existed, a confidence level significantly greater than .05 was obtained. Composite group means were used to determine if the differences between chance assignment of condition data were less or greater than the obtained differences. The means for the correction procedure included: 69.06%, 70.94%, 77.19%, 81.56%, while the means for the least-to-most procedure included: 64.69%, 74.59%, 72.81%, 70.31%. The lack of significance indicated that both treatments were similar in their effect. This confirmed the visual analysis of the data.

Reliability

Interrater reliability was calculated as the ratio of agreements to agreements plus disagreements on the responses that the instructor and the observers scored as correct and incorrect. The mean reliability for all conditions and behavior categories was calculated to be 98.12 with a range of 95 to 100 percent indicating scoring of the defined behaviors was consistent across observers. Interrater reliability was calculated every fourth session.

DISCUSSION

It is necessary to identify treatment effectiveness in order to achieve optimal results in instruction (Van Houten, 1987; Hung, Rotman, Cosetino, & MacMillan, 1983). Test, Spooner, and Cooke (1987) stated the "consistent identification of more powerful variables will contribute to a viable educational technology for intervention." According to the results presented here, individual instruction combined with correction resulted in a statistically

superior effect when compared to the percentage of pictures correctly identified when a least-to-most prompting procedure was utilized. In a group treatment, the converse was true. Group instruction combined with a least-to-most prompting system was statistically superior to group treatment combined with correction procedure. When the two techniques (i.e., individual instruction combined with correction, group treatment combined with a least-to-most prompting system) were directly compared, neither treatment demonstrated statistical superiority over the other.

In order to demonstrate the effectiveness of the various treatments, an alternating treatments design (ATD) was utilized. One of the strengths of this design is that it provides comparative data in a relatively short period of time (Barlow, & Herson, 1984). This was not demonstrated in this study. In fact, the alteration of phases in this study required an excessive amount of time. Each portion of the study took, approximately three months to complete. The design as employed in this study did not build on this strength.

Due to the randomization of the treatments and the limited number of sessions in each treatment phase, the effectiveness of visual analysis as a means of discerning differences between two instructional techniques was limited. Within each portion of the study, the number of adjacent conditions which allowed for direct visual comparison were few. In addition, the data reflected a large margin of overlap and variation in the treatments being compared. This problem was previously noted by Barlow and Herson (1984) Kazdin (1982), McReynolds and Kearns (1983), and Test, Spooner, and Cooke (1987) indicating their respective instructional effectiveness, it

was necessary for the researchers to rely on the statistical analysis of the data in order to identify any differences of significance between two treatments. Although this is an important advantage for ATD (Kazdin, 1984), it was done at the cost of obscuring individual performance as single phase means were utilized for statistical analysis. The use of the randomization test as a supplement to visual analysis proved invaluable. In the early phases of the study, the randomization test served as a useful tool to reliably identify those variables which deserved further study.

In order to meet the demands of the research design, it was necessary to counterbalance and randomize the variables to allow for direct comparisons of treatment effects. This controlled the effects one phase of treatment may have had on another (McReynolds, & Kearns, 1983). The only logistical difficulty the researchers encountered in counterbalancing the treatments was identifying sufficient numbers of vocabulary words with which each member in the various groups was unfamiliar. Once the successful identification of individual and group vocabulary deficits was completed and incorporated into the treatment packages (Oliver, 1983), there were few problems with either group or individual programming.

Unlike the difficulties Strain (1975) and Liberman (1968) encountered in group programming (i.e., differences in programming goals, differences in functioning level of students involved), the researchers met with some inconvenience during individual programming. Children who did not receive instruction during individual treatment had down or wasted time. That is, time in which directed instruction was not offered (Brown, Ford, Nisbet,

Sweet, Donnellan, & Gruenewald, 1983). This was a major concern as the children not involved in programming during individual instruction had approximately fifteen to twenty minutes of unsupervised and idle time. As other researchers have noted (e.g., Jenkins, & Mayhill, 1973), the concern here was not that either treatment was more effective in the efficient use of teacher time but that the subjects instructional time be optimal. Individuals were isolated from the other pupils during this time (Fink, & Sandall, 1980). On the other hand, children involved in group instruction received a structured program in which they were involved. Therefore, the minimal difference between procedures suggests more may be taught in group.

During group programming, the children received incidental instruction in a variety of skills which are necessary for their survival in a regular school setting (Koegel, Egel, & Dunlap, 1980) as well as enhancing their chance for successful integration in the regular classroom. Integration activities included working with and cooperating with others in a group and relying on peer approval and instruction. Brown, Hermanson, Klemme, Haubrich, and Ora (1970) found this type of teaching situation can also provide students with enjoyment. This was confirmed during this study as the subjects were more involved and enthusiastic during group instruction than in individual instruction. Training such skills at a young age may enhance the successful integration of children with handicaps. The development of such skills was especially evident during group instruction combined with a least-to-most prompting system.

Although both prompting procedures were equally effective in

their respective treatment packages, it should be noted the correction procedure developed some overreliance on the teacher. For instance, several children were observed holding out their hand waiting for the teacher to correct them after they had made the wrong choice of a picture. Other children pulled back from the instructor's correction, suggesting a punishing effect of the procedure. The use of such restrictive instructional procedures necessarily have to be faded and replaced with more natural cues (Stokes, & Osnes, 1988). On the other hand when a least-to-most prompting procedure was employed, the first level of cueing in either group or individual instruction was effective in assisting the pupil to make the correct choice. In fact, receiving such assistance from the researchers or another pupil allowed the subject to interact with his environment (Yoder, & Calculator, 1981). This natural consequence of their behavior did not appear to adversely affect the children. It appeared to confirm Kazdin and Erickson's (1975) finding that intrusive and physical means of control inhibit the quality of interaction between teachers and their students. This finding may be generalized to the quality of interactions between peers as well.

A necessary part of any behavioral program is the generalization of taught skills to other dimensions (Faw, Reid, Schepis, Fitzgerald, & Welty, 1981). Because the vocabulary taught was not brought to criterion levels, generalization was not demonstrated in this study. Bringing learned vocabulary to criterion levels would enable the "efficient acquisition of subsequent skills" (Test, Spooner, & Cooke, 1987) (i.e., expressive

use of vocabulary). Because of the alternation of targeted vocabulary and teaching skills, the subjects were not allowed to develop proficiency which limited generalization. In addition to affecting skill generalization, not bringing the vocabulary taught to criterion levels limited the validity of retention results. Maintenance of a skill requires that the skills be learned first. Unfortunately, the rapid alternations of the instructional phases did not allow the subjects to obtain the skill proficiency which was necessary to affect retention levels.

This study examined several treatment packages in order to evaluate instructional efficiency. Each was effective especially when compared to baseline levels. Although statistically comparable to individual instruction combined with correction, the technique which generated the most effective results was group intervention combined with a least-to-most prompting system. Both treatments resulted in high percentages of receptive vocabulary words learned, the group treatment package assisted in the development of specific interactional and other incidentally learned skills in the subjects. Tawney and Gast (1984) noted the rapid alternation of instructional variables as that presented here is artificial in comparison to that which occurs in a regular instructional sequence. In addition, the subjects who participated in this study were different for each section. The variability among the students may have affected the results (Stokes, & Osnes, 1988) of the study. Therefore, it is suggested that the results not be overgeneralized and investigation into all the treatment packages presented here be further studied (Van Houten, 1987).

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